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is one female (case of Cork, No. 28); there are thus about 25·6 per cent. or one-fourth of the female sex.

[*To be continued.*]

THE ANTIQUITY OF MAN.

How fully have the discoveries and researches of geologists confirmed the remarks of the poet,—

“The dust we tread upon was once alive.”

Everywhere, at various depths, and in various kinds of strata, have the numerous remains of living organisms been found,—the remains of living beings that played their part upon the earth for a time and then disappeared. The geologist has not only ascertained that such dust once lived, but has also arrived at a knowledge of the time which has elapsed since it was alive; so that we talk of the epochs of palæontology very much in the same manner as we do of those of history. Who among the wisest sages, three centuries ago, could have predicted that the crust of this planet should tell such a wonderful story—a story by which a knowledge of the various changes which it has undergone would be carried back millions of years? Who could have foretold then that so many generations of extinct creatures were entombed in the hard rocks, and preserved in a fossil state through periods of time in comparison with which the duration of Egyptian pyramids, catacombs, and mummies, is as insignificant as the lifetime of an ephemeride. Strange tales have, indeed, been told by mammoths, mastodons, plesiosauruses, and trilobites. We are startled when we open any well-written geological work, and read of the successive genera of animals which have inhabited this world, each one lasting its day,—which was doubtless a long one,—and another coming to act its part after it;—when we find it stated, that what is hill was once valley, and that what is valley was once hill;—that what is sea was once land, and that what is land was once sea;—that what is hard and compact rock, was once loose and incoherent sand; and that what is now loose and incoherent sand, was once hard and solid rock;—that our loftiest and most majestic mountains, with their bold granite peaks, defying the elements, were once slag and mud; and that what now forms mud at the bottom of the ocean formed, during olden times, the bold crests of elevated mountain ridges. While reading

about such astonishing matters, may we not, for a very good reason, pause for a moment, and inquire whether we have got into our hands a book somewhat akin to the *Arabian Nights*,—a book pleasing to the fancy, but totally unconnected with the realities of nature? But such is not the case; for as we proceed, we find that startling propositions and assertions are supported by solid arguments and a mighty array of facts. We cannot resist coming to the conclusion, when we weigh these arguments and consider the facts, that there is truth in that which is said,—that many of the statements are incontrovertible, and that assuredly we are not reading a book about dreamland, but one which discusses the sternest realities in the universe.

While many of the wonders of the Old World's history have been revealed by geological discovery, the ancient records of the earth's strata have not, till of late, thrown much light either on the antiquity or early condition of man. Within the last half-century, however, numerous human remains have been discovered buried in strata, which, although comparatively recent, are still of great antiquity when compared with the remotest time to which history can lead us back. Human bones, and even whole skeletons, have been discovered in such strata; while along with these, and in other strata without them, rude tools of stone, bronze, and bone, have been found, which attest that he was an inhabitant of the earth when those strata were formed. The discovery of these ancient human remains has led to various discussions with respect to man's antiquity,—both bones and tools being disputed as genuine; but unwearied scientific research and zeal have in the end triumphed, by fully establishing the genuineness of both bones and tools. The judgment, patience, and calmness with which scientific men have answered carping objections, are extremely praiseworthy; and not only are those tools alone made to supply evidence of man's existence in those ancient times, but the very marks on the bones of those animals which were killed by him, are made to throw light on the case in point. The discovery of the ancient ruins of cities in America, which shows that civilisation once existed in the land where the savage Red Indian has subsisted for innumerable ages on the produce of the chase; and of brown-haired mummies, which prove that the founders of that civilisation were a different race from these Indians, and were probably of European origin, has supplied us with further important evidence of the antiquity of man.

Of late, one of the most distinguished geologists of the age has written an elaborate work on this interesting subject,—a book delightfully written, and fraught with most important information on the question discussed: although, perhaps, a little prolix, and abounding

in irrelevant matter, which tends to make the reader lose sight of the main argument. But it may be said, in palliation of these faults, that the actual geological facts known bearing directly on the question, are, upon the whole, circumscribed; and that, in consequence, the author could not do otherwise than speculate upon the unknown, and point out the fields to be explored, when material to serve his turn was wanting. We have, not, therefore, those few strata only, in which man's remains have been found, described, but a most magnificent delineation of all the strata connected with them, and an elaborate investigation of their history, character, and the changes which they have undergone. So entertaining and fascinating are Sir Charles's descriptions of those gigantic geological revolutions, which have effected such strange changes in the structure of the crust of the earth, that the reader, far from cursing, feels inclined to bless, his digressive propensity. Although Sir Charles Lyell has designated his book *The Geological Evidences of the Antiquity of Man*, yet it should be more properly named "The Geology of the Strata in which Man's Remains have been found, or in which they may be found." Sir Charles has not exclusively restricted himself to the geological evidence; but has availed himself of that furnished by archæology, philology, and physiology. The work is not only one on the geological evidence of man's antiquity; but, also, on all other evidence which can be brought to bear on the point. Although, obviously, Sir Charles Lyell has thrown no new light on the antiquity of man, the most of the evidence brought forward, having previously appeared in other writings; yet he has treated the matter in such a superior manner, has imparted to it so much interest, has cast it in such a new form, and has so united scattered evidence and so conspicuously presented it to view, that the work cannot certainly be called a compilation, but a comprehensive philosophical treatise in which the arguments, discoveries, and observations of others, are used as material for enlarged and profound scientific generalisations.

It is remarked by Emerson, in his "Representative Men," that "Great minds are more distinguished by breadth than by originality," and this breadth of mind is perceived in all the writings of Sir Charles Lyell, in his "Principles" and in his "Elements of Geology"; and it is to this large, comprehensive handling of scientific subjects that a great portion of the extraordinary attractiveness of his writings, is particularly owing. As we read his works we are surprised at his far ken and range of vision, and wonder that so many of the bearings of facts and hypotheses upon each other, escaped our own observation. In considering this work, we can only regret that a book so finely written—a book in which the grand geologic changes connected with, and imme-

diately preceding, human existence, are delineated with the vivid conception of a poet, should, from the nature of the subject, want those enduring elements which ensure immortality. However, as our knowledge of this important question advances, it is to be hoped that this excellent scientific treatise shall keep pace with the progress of discovery by successive editions. It is a work, doubtless, that every lover of science and literature should feel sorry to see shelved or out of print.

It may be said that, in some respects several feel disappointed, on account of having fully expected that the question would have been treated altogether from a geological point of view; but it can easily be conceived that it was hardly possible to restrict it exclusively to the geological evidence; for, without the evidence supplied by other sciences being brought to bear on the geological, the latter could not be so well understood or appreciated. As yet, this department of science is in its infancy, and all that we know of it, is of a scattered and fragmentary character.

To unite isolated and disjointed facts, the sole resource of the writer, in the circumstances, was to reason boldly on the unknown, and bring conjecture to aid in constructing a rational theory capable of explaining the phenomena. The speculative character of the book, and its enlarged generalisations, we consider to be among its highest merits. It is highly suggestive, and cannot fail to lead the reader into new trains of thinking; for the writer never allows him to view the scenery from one point; but successively presents it to him from different positions, owing to which he is enabled to see it in all its variety. Well, indeed, do the words of Emerson apply to Sir Charles in this respect:—"Every surmise and vaticination of the mind is entitled to a certain respect; and we learn to prefer imperfect theories and sentences, which contain glimpses of truth, to digested systems which have no one valuable suggestion. A wise writer will feel that the ends of study and composition are best answered by announcing undiscovered regions of thought, and so communicating, through hope, new activity to the torpid spirit."

Indeed, "announcing undiscovered regions of thought," appears to be a principal aim of the "Antiquity of Man," and in few works has it done this to more purpose, and, assuredly, not many books are so well calculated to communicate "new activity to the torpid spirit" as this one is.

The first eleven chapters of the book discuss questions connected with those strata in particular, in which either the bones of man, or implements employed by him, or works constructed by him, have been found. We have a long and interesting account of the Danish

peat bogs, mounds, and kitchen middens, which have, for a length of time, so much excited the interest of archæologists and geologists. Those curious lake dwellings which have of late years been discovered in such large numbers, receive a large share of the author's attention. The flint instruments, first discovered and examined by M. Boucher de Perthes, are brought prominently before the reader's view ; while the arguments of that celebrated man are recapitulated and put in a new light. The ages of stone, bronze, and iron, are examined, and their relative antiquity considered. The progress of man, however, from the use of stone tools to those of bronze, and from those of bronze to those of iron, affords but an uncertain guide to the tracing of man's antiquity ; since all these kinds of tools may have been used contemporaneously by different tribes and nations bordering upon one another ; while the substitution of the one kind for the other may be as often owing to conquest as to its gradual introduction either by native discovery or commerce. There is very great reason to think that, long after the introduction of iron, both stone and bronze tools were used. Even in the time of Tacitus, arrows headed with bone were used by the Fenni, a tribe that inhabited the north-east of ancient Germany. Tacitus assigns as a reason for using bone the scarcity of iron ; but we may reasonably assume that it was fully as much owing to the low civilisation which he ascribes to them. If in the time of Tacitus this people used arrows headed with bone, it is not unlikely that stone weapons were also employed by them ; and on this account there are good grounds for inferring that a few centuries before the time of Tacitus both stone and bronze weapons were by no means unfrequent among several European tribes. The readiness with which iron succeeded other metals and stone, no doubt depended much on the aptitude of different peoples to use or apply it ; and when different nations were fiercely waging war with one another, it may well be supposed that those who lived in an iron-producing country, would use all their endeavours to prevent those who lived in a country less favoured to obtain this metal ; so that, in consequence, the latter would be constrained to use such substances as stone or bone from absolute want of that which was more efficient.

What the civilisation of the Fenni was, may be best learnt from Tacitus's own words :—"Fennis mina feritas, fœda paupertas ; non arma, non equi, non penates ; victui herba, vestitui pelles : cubile humus : sola in sagittis spes, quas inopia ferri ossibus asperant." *

While the extraordinary revelations of the peat mosses and shell mounds of Denmark, with respect to the existence of man in that country long before the historic period, excite our amazement, not

* Tacitus, *Germania*, cap. 47.

less striking are the wonderful tales told by those curious lake dwellings which have of late years been discovered in such large numbers. When these lake dwellings are considered, as well as the peat mosses and shell mounds of Denmark, the antiquity ascribed to them cannot be said to be in the least exaggerated ; and an age of 7,000 years assigned to the oldest, may be said to be under rather than above that which is justified by facts. As beech flourished in Denmark two thousand years ago, we may reasonably allow it a duration of two thousand years previous to that time, and as it flourishes now as well as ever, we may justly infer that it will last at least a thousand years longer. Climate changes slowly, and so do the physical features of a country ; and, during those slow changes, one species of tree followed the other in the forests of Denmark. Four thousand years is about as short a time as we can allow for the duration of beech, and, certainly, we may allow twice the time for a succession of two kinds of oak ; this will give a duration of 11,000 years to the highest portion of the Scotch fir. When we consider that since the inhabitants of the Danish Isles, whose remains are found in the shell-mounds, lived, the physical features of Denmark, and the communication between the Atlantic and the Baltic, have been so much altered, as to affect materially oysters and other shell-fish found on the coast, to conclude that such a time has elapsed since the shells were deposited in the mounds is highly reasonable.

There is no country which tends to impress the mind with a stronger belief in the great antiquity of man than the land of the Pharaohs. Here are to be seen the remains of a mighty civilisation, the beginning of which is completely hidden from our view by the mist of ages. Immense pyramids, vast cities in ruin, gigantic sculptures, paintings which have defied the injuries of time, hieroglyphics, and mummies, about which early history is ignorant, and which were greater mysteries to Plato and Herodotus than to modern Egyptologists. How remote must that period be when the ancient Egyptian, like the savage inhabitants of Europe at the time when Denmark was covered with forests of Scotch fir, or like the modern natives of Australia, New Caledonia, New Guinea, and other South Sea islands, wrought with stone implements and fought with flint and bone weapons ! When the inhabitants of Denmark, whose remains are found in the shell mounds and peat mosses, killed wild beasts with bone weapons and cut them down with flint hatchets ; when the inhabitants of Switzerland raised their wooden huts on lakes and feasted on the flesh of the fox ; did not the mighty cities of Egypt flourish in all their magnificence, abounding in superior artists and profound men of science ? their inhabitants in possession of numerous luxuries and refinements ; with a learned priesthood and

stable government; the useful arts ministering to their wants, and supplying them with innumerable comforts and enjoyments. Did not those ancient Egyptians trade along the coasts of the Mediterranean? and had they no intercourse with the barbarous tribes of Europe? Did not bronze and iron find their way across the Mediterranean from Egypt and Phœnicia to Greece, Italy, and Gaul? From the amazing progress which has been made during the last thirty years, in the knowledge of everything relating to man in prehistoric times, we are led to think that not many years shall elapse ere all these questions shall be satisfactorily answered. Egypt seems to us to be the land, more than any other, which brings archæology more closely in contact with geology; and nothing can be more pleasing to the lovers of science than to learn that the Nile mud deposit is likely to afford a clue to the knowledge of the antiquity of Egyptian civilisation. Almost every year some new light is thrown upon this subject by the discovery of ancient remains at various depths in the Nile valley.

Long after its discovery America was considered to be a land which had never made any progress in civilisation, a land which had not even been inhabited many centuries before Europeans had visited its shores, and whose inhabitants were supposed to have entered it by Behring's Straits from Asia. The Spaniards encountered in Mexico and Peru a very rudimentary civilisation, certainly, which was supposed to have been imported from the old world. No land could be imagined to form a greater contrast to Egypt than America, from being apparently so void of all monuments of ancient human art. But this continent appears now in a different light; monuments of ancient civilisation have been discovered over a vast extent of territory. Huge mounds, ruins of cities, sculpture, articles of gold and silver, and pottery attest that the western hemisphere was not always a dreary, vast, interminable forest, serving no other human purpose than a hunting ground for the naked, savage Red Indian. Those who created this civilisation seem to have been a different race from any of the present aboriginal ones; for the skulls excavated from some of the burying places are different from those of the Red Indians. Of late, mummies have been discovered in South America with brown hair, a fact which proves that a brown-haired race, at one time, abounded there. Whence this brown-haired race arrived, if not autochthonous, is a question not easily answered at present. If from Europe, they must have emigrated at a time long anterior to the earliest period described in history; and a civilisation must have existed on the western shores of this continent, of which all traces were lost at the time when the Roman sway prevailed in Britain, Gaul, and Spain. It may now be positively affirmed that America was inhabited by man at a very remote period, as human

remains are found there which have all the appearance of being as ancient as those found on the old continent. Under four superimposed forests, in the delta of the Mississippi, a human skeleton, along with some charcoal, is said to have been found, to which Dr. Dowler ascribes an antiquity of 50,000 years. Count Tourtalais found fossil human bones, consisting of jaws ; with some bones of the foot, in a calcareous conglomerate forming part of the coral reefs of Florida, which are estimated by Professor Agassiz to be 10,000 years old. At Natchez a human bone was discovered mingled with those of the mastodon and megalonyx. From these discoveries we anticipate a great many more in a few years to come.

Old as are the human remains found in the Danish shell-mounds and peat mosses in the lake dwellings, in the coral reefs of Florida, in cromlechs, barrows, and kist-vaens, much older than these, by far, are the flint implements and bones of man discovered in post-pliocene formations, in France, Belgium, and Sicily. In the valley of the Somme, in the valley of the Ouse, in the basin of the Seine, in the basin of the Thames, in the clay of the Hoxne, in the gravel of Icklingham, in the valley of the Ouse, in the caves of Engis, Engihoul, and Neanderthal, in a cavern near Wells, in the caves of Gower in Glamorganshire, in the Grotta di Maccagnone in Sicily, the indefatigable zeal and perseverance of the man of science, have traced out the bones of man and the rude stone tools used by him at a primitive stage of his existence, associated with the bones of numerous extinct species of animals, which passed away along with the telluric conditions to which their organism was related.

It is to M. Boucher de Perthes that the world owes the first discovery of these flint instruments in ancient alluvium containing the bones of extinct animals,—a discovery doubted for years, the sceptical suspecting that the tools were spurious ; but, at last, their genuineness has been completely established. No doubt there were impostures which justified the exercise of a degree of caution on the part of those who had not acquired the experimental skill in these matters, which readily distinguishes the real from the counterfeit. This skill, according to Sir Charles Lyell, was possessed by M. Boucher de Perthes, of whom he speaks in the following terms :—

“The antiquarian knowledge of their discoverer enabled him to recognise, in their rude and peculiar type, a character distinct from that of the polished stone weapons of a later period, usually called ‘celts.’”

The land and sea, the hills and valleys, the flora and fauna of Europe, have undergone vast and extraordinary mutations since man first trod upon its soil. Elephants and rhinoceroses grazed in the valleys of France and England ; hippopotamuses bathed in their rivers ; and cave lions and cave hyænas prowled in their forests, long after his appear-

ance in these countries. Long, indeed, must those men, whose remains are found in the post-pliocene deposit of the valley of the Somme, and in those singular caves in Belgium, England, and Sicily, mixed with the bones of these extinct animals, and which have so attracted the attention of men of science,—long must they have preceded those men whose remains are found in the shell-mounds of Denmark. Long, indeed, must have been the lapse of time from the period since those extinct species of animals abounded in large numbers till they disappeared entirely from the face of the earth! Countless generations of those men whose remains are found in the Danish peat-mosses and shell mounds, lived, died, and followed each other in succession through numerous ages and centuries; but with those extinct animals the earliest of these generations were not contemporaries.

Of Sir Charles's work seven chapters are devoted to the glacial period, from the twelfth to the eighteenth inclusive; and although, in the present state of our knowledge, this period is not so intimately connected with the question discussed, there being, as yet, no remains of man found in formations belonging to it, or preceding it; still it is the limit to the formations in which those remains have hitherto been discovered.

“It often happens,” says our illustrious author, “that when in any given region we have pushed back our geological investigations as far as we can in search of evidence of the first appearance of man in Europe, we are stopped by arriving at what is called the ‘boulder clay,’ or ‘northern drift.’ This formation is usually quite destitute of organic remains, so that the thread of our inquiry into the history of the animate creation, as well as of man, is abruptly cut short. The interruption, however, is by no means encountered at the same point of time in every district. Several Anthropologists are of opinion that man lived on the earth during most of the glacial period; but no sufficiently authenticated remains of him can, in the meantime, be pointed out to support this view.

These seven chapters on the glacial period form decidedly the most interesting portion of the book. The reader, who has already read all the scattered papers and dry tedious articles which have appeared on this department of geology, cannot but admire the plastic intellect of the writer who has reduced to order such a chaotic mass of details, and who has imparted beauty and fresh glowing life to a cumbrous heap of dull matter. His vivid description of the appearance which the surface of the earth presented during this singular period, when cold and ice ruled triumphant in the northern hemisphere, may well bear comparison with some of the most brilliant passages of our most distinguished historians. As we read these chapters we are transported

from the present world around us to that of hundreds of thousands years ago, when frozen seas occupied the space where well-peopled countries, abounding in numerous large busy towns, are found ; in which seas huge icebergs floated in various directions, as is at present the case in the Arctic and Antarctic Oceans ; when arctic mollusks lived in the Mediterranean ; when the favoured land of Italy felt the chill of a northern climate ; and when the glorious land of the East,

“ Where all save the presence of man is divine,”

was familiar with ice ; glaciers covering these Syrian mountains, which, myriads of years thereafter, supplied those far-famed cedars that were used by Solomon in the building of the temple.

Long did this period last ; its duration may, indeed, be counted in hundreds of centuries ; and while it lasted, mighty were the changes which were effected ;—land was submerged, and the sea rolled over it for many centuries ;—the bottom of the “vasty deep” emerged, threw off the yoke of Neptune, and claimed the right of being dry land ; mountains, thousands of feet high, whose summits were lost in the azure vault of heaven, sank into the depths of the earth, and many fathoms of brine flowed over them ;—the strata which formed the bottom of the abyss defied and overcame the pressure of the ponderous ocean, and sprang up in tall peaks to the sky ;—more than once were these strange things enacted ;—and lands which sank emerged once more, while those that had formerly emerged, were submerged. At one stage of the glacial period, according to that theory of emergence and submergence, which, in Sir Charles’s opinion, best explains the phenomena, the mountains of Wales were much higher than at present ;—at another stage 2,300 feet lower ; at one stage of it, Scotland was 2,000 feet below its present level, and other parts of Britain 1,300 feet ; then Great Britain and Ireland consisted of a few groups of small islands formed by the mountains of Wales, Cumberland, the Scottish highlands, Munster and Connaught, and, probably, of a larger island formed by the portion of England south of the Severn and the Thames. When we look at the maps at Chap. xiv. of this work, how strange are the emotions awakened within us as we think of the German Ocean and the Irish Sea forming one continuous body of water, studded with a few groups of small islands, which, during that period, represented the large islands of Great Britain and Ireland ;—when we imagine ourselves standing upon a lofty peak in one of those islets, looking around on a sea covered with enormous masses of floating ice, and rolling its waves over strata which now form the rich territory where the large and populous towns of Edinburgh, Glasgow, Manchester, and Liverpool, at present stand ; whose extensive commerce employs those innumerable ships which sail, with their

white canvas swelling in the gale, on those two seas on each side of Great Britain, which are the remains of that continuous ice-covered ocean !

Whether man existed while this long period of glaciation prevailed has not yet been determined ; although his remains being found in contact with glacial formations corroborates the opinion of those who maintain that he did. The formations of the glacial period itself, as clearly pointed out by Sir Charles, are, for the most part, destitute of organic remains ; so that, if any indications of himself or of his works are to be discovered in connection with this period, it is in preglacial strata that archæologists and geologists are to look for them. On this point Sir Charles remarks :—

“ For the present we must be content to wait, and consider that we have made no investigations which entitle us to wonder that the bones or stone weapons of the era of the *Elephas meridionalis* have failed to come to light. If any such lie hid in those strata, and should hereafter be revealed to us, they would carry back the antiquity of man to a distance of time probably more than twice as great as that which separates our era from that of the most ancient of the tool-bearing gravels yet discovered in Picardy or elsewhere. But even then the reader will perceive that the age of man, though preglacial, would be so moderate in the great geological calendar, as given at p. 7, that he would scarcely date as far back as the commencement of the post-pliocene period.”

The last four chapters of the work are devoted to a consideration of the theories of “transmutation and progression,” of the doctrine of “variation and natural selection,” as propounded by Mr. Darwin, and of the “Aryan migrations and language.” Throughout these chapters we perceive a strong leaning towards Mr. Darwin’s theory of the origin of species. Were we to suppose this theory true, and assume that all the races of mankind which at present inhabit the earth, are derived from one original race by “variation and natural selection,” we may arrive at some notions of the antiquity of man, by observing any changes which have taken place in the characteristics of these races, during that period of time in which history, sculpture, and other human records lend us their aid. But so far as these yield us their light, no change which scientific acumen can as yet discover, has taken place in the physical or mental primary qualities of any race ;—the Silurians, the native race of south Wales, are still dark, and the Caledonians, the native race of the north-east of Scotland, red-haired and large-limbed, as they were in the days of Tacitus ;—the modern Gaul is as easily elevated and depressed in spirit and as full of curiosity as his ancestor was in the age of Cæsar ;—Sir Archibald Alison points out in his History of Europe, that the modern Iberian displayed the

same patriotic enthusiastic courage in defending Saragossa, as the ancient Iberian did in defending Numantia ;—under William the Silent, in defence of civil and religious liberty against the bigoted tyranny of Philip the Second, the Dutch manifested the same ferocious, sturdy, obstinate valour, and love of personal freedom, which led classical writers to designate their Batavian forefathers the bravest of the German nations ;—the modern Copts and Nubians are identical in form and features with the ancient Egyptians ;—the Negroes of to-day are identical with those of 4,000 years ago ;—the Icelanders, whose Scandinavian ancestors settled in Iceland upwards of a thousand years ago, vary not in form, features, or character, from kindred peoples on the European continent ;—and the peculiar physical and mental qualities of the same Scandinavian race, blended in various degrees with those of the Celts, are readily distinguishable in the Hebrides, along the shores of the western highlands, and in the east of Ireland ; where the intermixture, although it took place a thousand years ago, has produced no new uniform race, but merely a mixed people. If all these races have been developed from one stock, and become what they are by a certain “law of variation and natural selection,” the rate of change has been so slow as not to be perceptible in 4,000 years ; now, a change going on at an uniform rate, which is not perceptible in such a length of time, would not be very striking in ten times this number of years, or 40,000 ; and we may safely assert that it would not produce so great a difference as exists between the Australian and Scandinavian in ten times that number of years again, which would amount to 400,000 years. Were this theory therefore true, it would carry back the antiquity of man far beyond anything which geology has hitherto brought to light ; but, however ingenious and attractive it may be, and however readily it may explain the phenomena of organic life, it must be said that in its present form, it is not thoroughly borne out by facts ; while numerous objections, founded on the peculiar conditions of animal generation and descent, may, more especially, be brought against many of its extreme points.

“The Origin of Species,” displays the immense physiological information and rare talents of the author ; while the suggestiveness of the general views, and the bold, rich, glowing speculative vein of thought which pervades the work, entitle it to hold the first rank among books on the philosophy of science ; yet, in the meantime, we must express our dissent from its extreme conclusions, and our doubt of species having been produced within the same range of influences as varieties are. With all its faults, the student of nature can hardly take up any manual which gives a more profound insight into the laws that govern the animal world than Mr. Darwin’s work ; and Professor Huxley

may truly say that the Darwinian theory bears the same relation to a true physiological science, as the Copernican theory does to a true astronomical one. This comparison is altogether judicious ; for when Copernicus placed the sun in the centre of the solar system, he laid the foundation of a true astronomy ; but he made the planets move round him in circles ; and this circular motion assumed for one which is really elliptical and spiral, is not unlike the doctrine of “variation and natural selection” carried to extremes. Let the *circularity* of the doctrine be a little modified and some *eccentricity* introduced, as has been done with regard to the Copernican theory, and there is a probability that the true theory is found. That species have been produced by “natural selection and variation,” independently of general changes in the condition of the globe, is a point highly questionable, notwithstanding all that is said by Mr. Darwin on the pigeon race. The production of an endless number of varieties is highly possible ; but we hold that there is a limit to their range. In looking at the animal world around us, we perceive that every species has a range of modification, which is entirely dependent on certain conditions ; but the several modifications seem to resemble imperfect circles, an endless number of which can be described, all varying from each other, but bearing a resemblance more or less close to a perfect one. A breed of oxen, sheep, or horses, may be improved to a certain pitch ; but here the improvement ceases ; and, in a similar manner, education and other influences produce certain changes on the races of mankind ; but to these changes also there is a limit—a barrier which cannot be passed. Nowhere has it been found that civilisation or climate has produced any effect on one race, tending to change it into another. In the East Indies Frisians have not been converted into Malays ; in South America Iberians have not been converted into Red Indians ; the Portuguese have not been transmuted into Negroes or Caffres in Africa, or into Chinese in Macao ; the French are the same race in Cayenne, Guadaloupe, Louisiana, and Canada ; in every zone, and under the influence of almost every climate, these peoples have retained the peculiar physical and mental characteristics of the races to which they respectively belong. If mankind were originally one race, the most probable explanation of the present diversity is, that it has been produced by great general changes in climate, as well as in other physical conditions of the globe. We learn from geology how often the climate of the earth has changed ; but we do not yet, very well, understand how those changes were brought about ; probably astronomy may, in a few years, throw some light on this obscure subject, and reveal the existence of some conditions by which the earth and her inhabitants are influenced at some periods more than at others, exactly

as is the case with the four seasons of the year. Then it may, perhaps, be ascertained that diversity of race has been produced in a shorter time than that in which the doctrine of "variation" would account for it. Eminent Anthropologists point out the recurrence of mixed races to the original native type, after a lapse of centuries, and adduce Spain, France, and Italy, as instances of countries in which the blood of the intrusive conquering peoples, has, to a great extent, disappeared, and whose present inhabitants are almost identical in racial qualities with those who preceded the intermixture with invaders. In families we observe that atavism is a wonderfully prevalent law; that there is nothing more frequent than to observe children closely resembling grandfathers and great-grandfathers; that, sometimes, the different features are inherited from different progenitors; that a peculiar form of nose, eye, chin, hand, or foot, may be traced out among several third and fourth cousins; that a colour of eye, which has disappeared in two generations, returns in the third; and that the colour of hair and shape of head, which have disappeared in three generations, return in the fourth. We observe, when parents differ in the colour of the hair, that, usually, the children have, alternately, the hair of father or mother. If the father has red hair and the mother flaxen, these colours do not mix, but the child is either flaxen-haired or red-haired; or if grandfather or grandmother was brown or black-haired, probably brown or black-haired. The same remarks apply to all the different parts of the body,—to the complexion, the colour of the skin, the voice, and the walk.

A similar law of recurrence pervades the animal kingdom, and is observed in families of horses, swine, oxen, sheep, dogs, and cats. The following is an instance of the law of succession in the case of cats:—The daughter and grandmother are similar in colour and form, the colour of each being dark grey spots on a white ground; the mother and great-grandmother, also, resemble each other in form and colour, the colour of each being red spots on a white ground. Similar instances might be multiplied in the case of other animals. It will be perceived, then, that here we have a limit to endless variation, by which varieties are circumscribed and held to a central normal type. When animals are brought from one country, or continent, to another, they undergo some change, as the case may be, corresponding to the new influences brought to bear upon them; but in a few generations they acquire a fixed form and character.

The usual boundary employed to separate species we believe to be wrongly fixed. Whether species breed together or not depends upon their nearness or remoteness. Those which are remote from one another do not breed, those which are somewhat near produce hybrids which do not breed with one another, and those which are nearer pro-

duce a mixed breed the duration of which is proportionate to their proximity. Difference and permanency of type is the true distinction of species. A modification of a permanent type constitutes a variety. The permanency of species may be said to be limited by geologic changes, accompanied by general changes of climate ; while variety is dependent on partial differences of climate in different parts of the earth, on local circumstances, and on artificial expedients. We learn, from geology, that the crust of the earth has undergone numerous successive changes, and that while these changes were being effected old species disappeared and new ones appeared. This appearance of new species and disappearance of old ones, is, certainly, more satisfactorily explained by the theory of transmutation than by any other hitherto offered, and this transmutation has, doubtless, been effected by peculiar conditions of the earth, and not in the ordinary manner in which varieties are produced. The strongest objections made to the theory of transmutation have, no doubt, been made, principally, in consequence of the conclusions to which it leads, viz., in uniting man so closely with the animal-creation ; but granting man to be developed from the lower animals, it does not necessarily make him one of them, any more than it makes an animal one of the vegetables by conceiving the animal kingdom to be derived from the latter. The several divisions of nature pass imperceptibly into one another ; and, as the line of demarcation is not very distinct, the difference is more properly seen at a distance from the boundary.

The different races are, no doubt, of different antiquity, and the lower ones, assuming the theory of progression to be true, are the oldest. Ten thousand years are but as yesterday in the antiquity of man ; races are, to all appearance, extinct now which inhabited the world myriads of years before Celts, Scandinavians, Saxons, Slavonians, or Iberians were in existence ; and, probably, Negroes, Hottentots, Australians, and Red Indians, played their part on the face of the globe a hundred thousand years before white skins, blue eyes, and light hair appeared in Europe.

Those ancient skulls which have been discovered within the last few years, have led to rare and interesting discussions, and their peculiar development strongly supports the theory of transmutation and progression. The Neanderthal skull has certainly acquired a celebrity which we may be sure its owner never expected in his lifetime ; and has suggested as many suppositions as were suggested to Hamlet by the skulls thrown up by the gravediggers. Several scientific men think that this skull belongs to an individual of a race which became extinct thousands of years preceding the historic period, but we must be cautious in our speculations until more of the kind are found.

The twenty-third chapter of Sir Charles's work on the Antiquity of Man is devoted to the subject of language. Philologists have discovered widely prevailing analogies among numerous groups of languages, in consequence of which they have been led to examine their structure with care and attention ; and, from vigilant research, they have arrived at the conclusion that each of these groups has been derived from one common tongue. The most important of these groups is that usually called the Indo-European, or Aryan. These Aryan languages extend from the Ganges to the Atlantic ; and it would of course, have required a great many ages for one language to ramify into so many others, which are now so widely different that common affinities can only be perceived and traced out by the ablest scholars. Of these languages Sanscrit is the farthest east, and Gaelic the farthest west. Were there a rate of change known so far as regards speech, it can readily be conceived that the time which has elapsed since the Aryan language was one till the present, might be estimated ; but the rate at which language undergoes change, is so dependent upon peculiar circumstances, and so inconsistent, that it is exceedingly difficult to render its mutations available as a measure of duration. The Aryans are supposed to have extended themselves from central Asia eastward into India, and westward into Europe, forming several nations both in Europe and in Asia ; but a strong objection to this theory of Aryan migration is, that the peoples and nations which speak these cognate languages, consist of widely different races, and that if they were all derived from this single Aryan race, a much larger time must be allowed for their conversion into several new races than the advocates of the Aryan theory assign to those migrations ; but on the supposition that the Aryans were a conquering people, who subdued aboriginal races, intermixed with them, and imposed their language upon them, this difficulty is removed. In order to give a rational explanation of the phenomena of anthropology, it is certain that a much higher antiquity must be assigned to man than has hitherto been done, and doubtless Sir Charles Lyell has underrated rather than overrated it. A more temperate treatise than his could hardly be written on a question which, at present, excites the strongest interest in the scientific world.

The handling of such a subject as the Antiquity of Man, as may be easily conceived, requires to be done with circumspection ; as any views that may clash with the present accepted interpretation of holy writ are sure to elicit the cry of heterodoxy from the bigoted ; and disagreeable contests between the teachers of Christianity and the votaries of science, should be, as much as possible, avoided. That the teacher of religion should feel alarmed at any new speculations

which he may think lead to the diffusion of theological error, is nothing strange ; and, supposing he may give them undue opposition, he is, to a certain extent, to be excused for his zeal and well-meaning intentions ; also, if the enthusiastic man of science starts bold hypotheses, not sufficiently supported by facts or observation, he is still entitled to be treated with a degree of indulgence by the religious community. It is very much to be regretted that almost every advance which has for centuries been made in science, has been, at the commencement, violently opposed by many of the clergy. Surely the strong opposition which has so frequently been offered to new views on such matters, subsequently established, ought to teach those who are ready to risk the truth of scripture on received explanations, more caution. It may be safely affirmed that many of the current interpretations of the sacred text, cannot be reconciled with the facts of science ; but it is to be hoped that some of our erudite and profound divines will give this question their calm consideration, and so throw such light upon it as shall remove the contradictions between christian theology and anthropology.

POSITION OF THE FORAMEN MAGNUM.

By PROFESSOR JEFFREYS WYMAN, Corr. Memb. A.S.L.*

THE fact, to which attention was called by Daubenton, more than a century ago,[†] that the foramen magnum is situated farther back in apes than in man, naturally led anatomists to inquire whether any of the human races more nearly approach the apes in this respect than the rest. Soemmering made the assertion that such is the case in the Negro, and his statement has been quite generally repeated by subsequent writers. Prichard, however, satisfied himself that such is not the case, and after having examined "many Negro skulls," states that the foramen corresponds in position with that of the white races, viz. : "exactly behind the middle of the antero-posterior diameter of the basis cranii."[‡] He, however, finds it necessary, in order that this should be the case, to make some allowance for the projection of the jaws. We have seen no account of the manner in which the measurements on which this opinion rests were made, except that the jaws

* From the *Proceedings of the Boston Natural History Society*, vol. x, 1868.

† "Sur la Difference du Grand Trou Occipital dans l'Homme et dans les autres Animaux. *Mémoires de l'Acad. des Sciences*, 1764.

‡ *Researches into the Physical History of Man*, vol. i, p. 285, London, 1851.